

REMARKS

This application is a continuation of prior application no. 09/406,664, and is being filed to continue prosecution of the claims of said prior application. This Amendment is being submitted to amend the claims to more clearly describe the differences between the claims and the prior art, and to amend the specification to add a reference to said prior application.

Claims 1-45 are pending in this application, and in an Office Action dated June 16, 2003 issued in connection with the prior application, the Examiner issued a final rejection of all of these claims over the prior art, principally U.S. Patents 5,825,191 (Niijima, et al) and 5,940,545 (Kash, et al.). In particular, Claims 1-4, 6-8, 10, 12, 31, 32 and 34-40 were rejected under 35 U.S.C. §102 as being fully anticipated by Niijima, et al; and Claims 5, 9, 13-16, 22, 27, 33 and 42-45 were rejected under 35 U.S.C. §103 as being unpatentable over Niijima, et al in view of Kash, et al.

Claim 11 was rejected under 35 U.S.C. §103 as being unpatentable over Niijima, et al in view of U.S. patent 6,172,512 (Evans, et al); and Claims 17, 18, 23-25, 28-30 and 41 were rejected under 35 U.S.C. §103 as being unpatentable over Niijima, et al in view of Kash, et al and further in view of U.S. Patent 6,327,394 (Kash and Tsang). Claims 19-21 and 26 were rejected under 35 U.S.C. §103 as being unpatentable over Niijima, et al in view of Kash, et al, Kash and Tsang and further in view of U.S. Patent 5,664,158 (Latimer).

Applicants herein amend independent Claims 1, 2, 12, 31 and 43 to more clearly describe differences between the claims and the prior art. For the reasons set forth below, Applicants believe that Claims 1-45, as presented herewith, patentably distinguish over the prior art, and are allowable. Consequently, the Examiner is asked to allow Claims 1-45.

This invention is directed to the analysis of circuit activities in integrated circuits. In accordance with the invention, information about individual switching events of an operating integrated circuit is obtained and analyzed, using logic and timing analysis, to characterize switching activities in a region of interest.

The references of record fail to disclose or suggest the principal of obtaining information about individual switching events of an integrated circuit, and then analyzing that information, using logic and timing analysis, to characterize switching activities as described above.

For example, Niijima, et al discloses an IC fault location tracing apparatus. This apparatus utilizes a combination of a semiconductor IC tester, a charged particle beam tester, and CAD data produced in the design stage of the IC device. In particular, a control device is provided that stores net list data and mask layout data.

In use, the semiconductor IC tester applies a test pattern to the IC, and, as a result, the IC generates a secondary electron beam emission. The charged particle beam tester measures that secondary electron beam, and displays an electron distribution in the IC as a potential contrast image. The control device instructs the charged particle beam tester to locate the fault position in the IC by tracing back the circuit of the IC device by means of a visual field.

Thus, the Niijima, et al system relies on the analysis of a secondary electron beam emission collected broadly from a region of interest.

The present invention operates in a completely different way. In contrast to the broad electron beam analysis employed in Niijima, the present invention characterizes and analyzes information about individual switching events. That information may then be used to isolate circuit faults.

Technology for sensing individual switching events is disclosed in the cited references, and, for example, such technology is shown in Kash, et al. and Kash and Tang. It would not have been obvious, however to have combined this technology with the system shown in Niijima, et al., though, for a number of reasons. First, there is no suggestion in the references to do this. The broader electron beam emission analysis used in Niijima, et al is one approach for analyzing IC circuits and there is no teaching in Niijima to use another approach. Also, the Niijima, et al. system includes a number of features, such as the control device, specifically designed to work with the broader, electron beam analysis employed therein. Many of these specifically designed features would be rendered unnecessary or useless if the Niijima, et al system were modified to analyze individual switching events. It is submitted that it is not obvious to modify a basic system so as to render unnecessary or useless features specifically designed for use in that system.

Claims 1, 2, 12, 31 and 43 are herein being amended to more clearly describe the above-discussed aspect of the invention. In particular, Claim 1 is being amended to include the step of resolving the switching activity of individual switching events. Analogously, Claim 12, which is directed to a system for characterizing circuit activity, is being amended to set forth positively means for detecting and recording individual switching events.

In addition, Claim 2 is being amended to indicate that the recording step includes recording data values identifying locations and times of said emissions to identify individual switching events, and analogous apparatus limitations are being added to Claim 31. Also, Claim 43 is being amended to include the limitation that the collected time resolved light emissions from the circuit component is done to identify individual switching events.

Because of the above-discussed differences between Claims 1, 2, 12, 31 and 43 and the prior art, and because of the advantages associated with these differences, these Claims patentably distinguish over the prior art and are allowable. Claims 3-11 are dependent from Claim 2 and are allowable therewith; and Claims 13-30 are dependent from, and are allowable with, Claim 12. Similarly, Claims 32-42 are dependent from, and are allowable with, Claim 31, and Claims 44 and 45 are dependent from Claim 43 and are allowable therewith.

For the reasons advanced above, the Examiner is respectfully asked to allow Claims 1-45.

Every effort has been made to place this application in condition for allowance, a notice of which is requested. If the Examiner believes that a telephone conference with Applicants' Attorneys would be advantageous to the disposition of this case, the Examiner is asked to telephone the undersigned.

Respectfully Submitted

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